Date: 13/05/2016.

Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: VI (Mechatronics) Engineering

Regular Examination April – June 2016

2MC605 Sensor Systems

Time: 3 Hours **Total Marks: 70**

Instruction: 1. All questions are **compulsory**.
2. Figures to the **right** indicate full marks.
3. Answers to the two sections must be written in **separate** answer books.

Section – I

Que:-1 **Attempt All.** **12**

(A) Explain working of absolute encoders with figure.
(B) What is pulse width modulation? Explain with application.
(C) Explain the selection parameters of pressure transducer.

OR

Que:-1 **Attempt All.** **12**

(A) Explain Reliability and derive the expression for the Reliability of sensors $R(t) = e^{-\int \lambda(t)dt}$ where λ=failure rate.
(B) Explain oxygen sensor with diagram and in context of various applications.
(C) Explain the selection parameters of position transducer.

Que:-2 **Attempt All.**

(A) Explain how to automate drip irrigation system used in agriculture in a Greenhouse by using sensors (Moisture sensor, Temperature sensor etc.). Justify it. **6**
(B) Compare Thermocouple, RTD and Thermistor. **5**

OR

Que:-2 **Attempt All.**

(A) Explain the interfacing of shaft encoder with microcontroller and write down code for obtaining linear displacement. **6**
(B) Explain working of accelerometer with diagram. Also explain Piezoelectric accelerometers. **5**

Que:-3 **Attempt All.** **12**

(A) Enlist various automotive sensors and their applications.
(B) Explain the parameters for the data acquisition using LABVIEW environment?
(C) How will you do Restaurant Management using sensors? Case: 2 tables(C1 and C2) for cook located at centre, 6 tables(1,2,3,4,5,6) for customer arranged around tables for cook, 3 types of dishes(A,B,C) that can be ordered.
The manual work is to be eliminated with the payment of bill also automated.

Section – II

Que:-4 Attempt All. 12

(A) Explain R-2R ladder DAC.

(B) Explain Sample and Hold circuit.

(C) How the Capacitance is used in sensor construction.

OR

Que:-4 Attempt All. 12

(A) Draw the block diagram to representation of position of sensors in a data acquisition System and Briefly explain.

(B) Justify that a seismic sensor is a 2nd order sensor device.

(C) How the Magnetism is used in sensor construction.

Que:-5 Attempt All.

(A) Explain the 1st order and 2nd order Low-Pass filters in detail. 6

(B) Explain the terms- Quantization, Nyquist theorem and Hall Effect. 5

OR

Que:-5 Attempt All.

(A) A 10 bit successive approximation ADC is used to convert the analog input Vin= 0.6 volts to digital with Vref=1 volts. Explain the steps and Find the digital value for given analog Vin. (Show the calculation step by step). 6

(B) What is the difference in single ended and differential ended measurement systems? Explain in detail. 5

Que:-6 Attempt all. 12

(A) A 1st order sensor has time constant of 0.5 sec. It is sensing a process parameter that is sinusoidal in nature having a frequency of 3MHz. Determine the dynamic error of the system.

(B) Following are the specification of a laser displacement sensor:

a) Measurement range: + 10mm
b) Measurement point: 40mm
c) Resolution: 3µm
d) Linearity: 1 % Full scale
e) Response time: 0.15ms
f) Linear output: 4-20mA

Answer the following questions

a) Explain the meaning of each term
b) Suppose, the distance between the sensor and object is 35mm. then what will be output in mA?
c) What is the error due to nonlinearity?
d) Find out the sensitivity of the sensor.

(C) Explain the terms- Linearity, Accuracy, Resolution and Output impedance

END OF PAPER